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Mathematical Anxiety among Business Statistics Students

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ABSTRACT

A survey instrument was developed to identify sources of mathematics anxiety among undergraduate business students in a statistics class. A number of statistics classes were selected at two colleges in Long Island, New York. A final sample of n=102 respondents indicated that there was a relationship between the mathematics grade in prior mathematics courses and the expected grade in business statistics. The level of math anxiety reported by the respondents was related to the grade in previous math courses and was not related to the respondent's GPA.

INTRODUCTION

In an early study of 441 pre-calculus students, Calvert (1981) found that females were more likely to have higher levels of math anxiety than males. It was also found that students who had completed more difficult courses in math had less anxiety than those who had only completed a general mathematics course. Finally, Calvert found that students who had achieved only a C in previous math courses were more likely to have math anxiety than those who achieved a higher grade.

In contrast, Llabre and Suarez (1985) found that math anxiety had little to do with course grades in an algebra class. The sample consisted of 112 women and 72 men. Holden (1987) reviewed research findings related to sex differences in math, which indicated an apparent decline in math anxiety among females.

In a study of 68 students in a masters degree program in education, Perney and Ravid (1990) found course performance in statistics was not related to attitudes toward statistics, mathematics self-concept, mathematics background or attitudes towards tests.

Bernstein, et al. (1992), administered an attitude scale to 1,152 students from vocational-technical and comprehensive schools in 12 New Jersey high school districts. They discovered that from age 14 to 19, females expressed

more math anxiety than males. Math anxiety was, however, found to be significantly lower for both sexes when they had completed a number of math courses.

In a survey of 166 business students, Zanakis and Valenzi (1997) confirmed that test taking and lack of understanding of statistics were the highest sources of anxiety. They found the statistics course grade was influenced by math anxiety and computer experience. In a review of the literature dealing with undergraduate performance in statistics, Zimmer and Fuller (1996) found that a positive computer experience reduced anxiety and improved the attitudes of some students in statistics. They also indicated a relationship between statistics anxiety and attitude and performance in statistics.

THE SAMPLE

An instrument was developed to allow for self-reporting of mathematics grades and mathematics anxiety levels. During the fall, 1999 semester, the survey instrument was distributed to business majors in four statistics classes taught in a school of business administration at two colleges in Long Island, New York. All the respondents had taken a pre-calculus and calculus course as prerequisites to the current statistics class. The completed sample consisted of n=102 surveys.

The survey consisted of one page with fifteen questions. It was estimated to take no longer than three minutes to complete the survey. The respondents were assured of anonymity. The questionnaire asked for information concerning previous mathematics grades (in calculus and pre-calculus), overall GPA, the expected grade for the current statistics class, and attitudes towards mathematics in general and the statistics class in particular. The survey was distributed during the tenth week of the semester.

The respondents were fairly evenly divided between males and females (52% v. 48%) and consisted of upper-class students (juniors and seniors). The sample contained 72 juniors and 30 seniors.

RESULTS

A correlation was done between the respondent's self-reported grade in calculus for business students (a prerequisite course) and the grade they indicated that they felt they would earn in statistics. The correlation coefficient was .72 ($p<.001$). A similar correlation coefficient was obtained when the pre-calculus grade and the projected statistics grade were compared ($r = .67$, $p<.001$).

The students were also required to complete an introductory computer course as a prerequisite to the statistics class. The correlation between the reported grade in the computer class and the projected grade in statistics was .81 ($p<.001$).

When subgroups were analyzed, of those respondents who indicated having received an A or B as a final grade in pre-calculus, 84% of them reported low anxiety towards statistics. A similar percentage of A or B students in calculus also reported low levels of mathematical anxiety. When the students reporting an A or B in the computer class were analyzed, it was seen that 97% of them indicated feeling only low levels of math anxiety in the statistics class.

On the other hand, when the respondents were separated into groups reporting a C or D in each of the classes, the level of self-reported anxiety

increased. On a five-point Likert scale, the percentage of students reporting either very high or high levels of anxiety in the C or D group from pre-calculus was 82% . In the C or D group from calculus the percentage reporting high levels of anxiety was 79%. And finally, 76% of the C or D students in the prerequisite computer class reported high levels of math anxiety.

The respondents were then separated based on GPA, irrespective of mathematics grade. Of the respondents reporting a GPA of 3.5 or higher, 53% reported feeling low levels of mathematical anxiety. In the group of students reporting an overall GPA of 3.0 or lower, 47% reported feeling low levels of mathematical anxiety.

DISCUSSION

Mathematical anxiety is still being reported by a number of business statistics students. Anxiety levels would appear to be strongly related to previous success in mathematics courses and computer expertise. As was seen, those students reporting high grades in previous math and computer courses expressed lower levels of math anxiety than did those who reported not doing well in the previous classes. This pattern allows the statistics instructor to identify those students most likely to exhibit high levels of math anxiety in the class. The instructor can then concentrate efforts on this group of students to help alleviate anxiety.

A strong correlation has been calculated, between a previous grade in both pre-calculus and calculus as well as in the computer class and the student's projected grade in business statistics. It appears that previous success in a mathematics and/or a computer class correlates highly with continued success in business statistics.

When the students were separated according to overall GPA, there was very little difference in mathematical anxiety levels between the different GPA groupings. The students with high GPA's and the students with low GPA's reported levels of mathematical anxiety in about the same

proportions. Thus, it would seem that overall GPA plays little, if any, role in the level of mathematics anxiety.

Based on these results, the statistics instructor would be advised to use previous math and computer grades as a strong predictor of how a student will perform in the business statistics class. This would allow the instructor to identify those students most likely to perform poorly, and efforts can then be concentrated on this group of students.

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